



Telecommunications policy in Pakistan

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Abstract

The telecommunications in Pakistan is currently going through a period of transition as technological advances and liberalization of the industry move the industry into position to compete in an increasingly competitive world and regional environment. This paper surveys these developments with emphasis on the policies initiated by the government in recent years. In particular, attention is given to identifying the main patterns of growth in the telecommunications sector, and in assessing the manner in which these patterns have been affected by government policy. This paper concludes with speculation as to the impact current and future technological advances will have on the sector, with an appraisal made of the likely direction of future public policy. © 1998 Elsevier Science Ltd. All rights reserved.

1. Introduction

Traditionally, telecommunications had been regarded as a relatively straightforward public utility. Economies of scale, political and military sensitivities, and large externalities made this typical public service believe itself to be a natural monopoly. In Pakistan, as in most developing countries, telecommunications services were run by a government agency, Pakistan Telephone Corporation (PTC). Unfortunately these state monopolies generally fell far short of meeting needs, as evidenced by a persistent large unmet demand for telephone connections, call traffic congestion, poor service quality and reliability, limited territorial coverage, demonstrated willingness of users to pay far higher prices to obtain service, the virtual absence of modern business services, and user pressures to bypass the system by building their own facilities.

Technological advances and momentum for reform have changed all that. In their hunger for capital and technology to build telecoms networks, governments around

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the world are embracing ideas that a decade ago would have been heresy. Monopolies are being broken up and new private-sector firms are being encouraged to enter the business. In particular foreign companies, capital and technology are seen as the key to the sectors modernization and growth (Clifford, 1994).

Nowhere is the pace of change faster than in Asia. The more advanced countries such as Japan, Hong Kong, and Singapore are focusing on leading-edge services ranging from new generations of wireless telephones to high-speed communications links that can carry video as well as voice. Pakistan (and much of the rest of Asia) is redoubling its efforts to expand its systems as rapidly as possible.

For its part the government of Pakistan (GOP) considers the expansion and rehabilitation of the telecommunications network to be an area vital to the survival and progress of the nation. Vast sums of money have been spent and are being allocated for telecom projects funded by the World Bank, the Asian Development Bank, Pak Telecom (PTC) internally generated funds, Pakistan government funds, and vendor-financed projects. In fact, since the mid-1980s the GOP has been aware of the need to overhaul the telecommunications sector in order to generate capital for investment, improve the performance of the operating enterprises, and respond to rapidly growing business pressures for improved telecommunications services. In this regard the movement toward reform in Pakistan is driven by the same forces at work in many developing countries—technology and demand—and is reinforced by the recognition of the sector's importance for productivity, competitiveness, and participation in the world economy.

These developments are detailed in the sections that follow. In particular we are interested in the following:

1. Identifying the main patterns of growth in the telecommunications sector.
2. Assessing the manner in which these patterns have been affected by government policy.
3. Identifying the more successful foreign and domestic firms in the industry, and the strategies pursued by these companies.
4. Evaluating the government's privatization of the sector and assessing its chances for success.
5. Speculating as to the impact current and future technological advances will have on the sector.
6. Appraising the likely direction of future public policy.

2. Overview

The decisions made by governments, politicians, and administrators and by private organizations and international agencies have shaped the structure of the telecommunications system as it exists today. These developments are now extensively documented (Jussawalla and Lamberton, 1982; Saunders, Warford and Wellenius, 1994; Wellenius, 1993; Smith and Staple, 1994) in a rapidly growing literature. Thus, despite steady expansion over the past decade (Table 1), Pakistan's telecommunications

Table 1
Pakistan: post, telegraph and telecommunications development

Year	Post offices			Number of telephones	Public call offices
	Urban	Rural	Total		
1970–1971	67	139	206	160,103	750
1971–1972	68	139	207	167,200	815
1972–1973	68	141	209	184,103	728
1973–1974	69	141	210	201,354	734
1974–1975	70	145	215	227,604	742
1975–1976	72	147	219	249,300	1,213
1976–1977	72	149	221	274,647	1,459
1977–1978	72	151	223	288,161	1,559
1978–1979	80	151	231	314,000	1,587
1979–1980	85	152	237	336,275	1,634
1980–1981	89	163	252	358,815	1,689
1981–1982	101	177	278	388,360	1,696
1982–1983	108	186	294	445,000	1,888
1983–1984	111	199	310	461,000	1,960
1984–1985	121	220	341	573,000	2,194
1985–1986	142	245	387	630,500	2,428
1986–1987	152	268	420	679,372	2,807
1987–1988	165	281	446	743,872	2,917
1988–1989	174	294	468	839,000	3,093
1989–1990	186	300	486	922,500	3,393
1990–1991	195	302	497	1,188,000	3,861
1991–1992	299	210	509	1,460,700	4,676
1992–1993	320	210	512	1,547,527	5,618

Source: Government of Pakistan, Finance Division, Economic Advisor's Wing, Economic Survey, 1993–1994, p. 90.

network, as noted above, remains inadequate as a result of a combination of under investment, outmoded technology, and institutional constraints. Pakistan's telephone density of only seven direct exchange lines per 1000 population is among the lowest in Asia. With a population growth of more than 3% pa, the country will be hard put to significantly raise the density, despite current plans for rapid expansion.

3. Main problems

Telephone services experience high fault rates, and the average waiting time for a telephone exceeds 4 years. In addition serious problems exist with crosstalk, noise, and significant downtime, particularly when it rains during the monsoon. Voice lines are very noisy, and most calls must be tried several times before getting through, even during off-peak hours.

International calls dialed to Pakistan are often not completed for lack of circuits, or are very noisy. During busy hours, calls are limited to a certain number of

minutes, then, following a warning beep, they are disconnected to clear the circuit for another user.

By the late 1980s, the country's inadequate telecommunications network had become a major constraint on economic development, particularly in industry, banking (Jaffery, 1995) and commerce (ADB, 1990). The shortcomings in the country's existing network are a product of the developmental constraints facing a poor, backward nation. In turn, these shortcomings have been the major impetus behind the government's current policy of deregulation and privatization.

4. Brief history

The foundations of the communications and transport infrastructure in Pakistan were laid during the period of British rule. The Post and Telegraph Department was a central department under the Government of India, rather than under the provincial governments. After 1947 the Pakistan Telephone and Telegraph Department (T&T) was also under the federal government. Postal operations were separated from telephone and telegraph operations in the late 1950s, and were handled by a postal department which also came under the central government. Joint post and telegraph offices were opened, although the majority of post offices remained without telegraphic facilities. Public call facilities were also available at certain centers.

Telecommunications facilities remained limited during British rule, and more rapid growth occurred after 1947. At independence, only 12,436 telephone lines were in existence; and these too were highly concentrated in a few urban centers. Only two manual exchanges existed, at Karachi and Lahore. These two cities were also connected through a long-distance overhead line. With a population in 1947 around 35 million, the density of telephones was less than 0.355 per thousand, or roughly one telephone for every 3000 people. Thus, the legacy of colonial rule was a virtually undeveloped telecommunication infrastructure.

Telecommunications in Pakistan has been a virtual public-sector monopoly. Even the privately operated exchanges of the British period, like the Bombay Telephone Company in Karachi, were nationalized after 1947. In the absence of major private-sector involvement, capital expenditure in the telecommunications sector has been made through the government, either directly or through bilateral arrangements with foreign governments or international agencies. This investment has, in turn, been underwritten by the net revenue surpluses generated by T&T (and its successor Pakistan Telecommunication Corporation (PTC), which has throughout enjoyed positive returns, only part of which were reinvested in the system.

5. International comparisons

Currently, Pakistan and its neighbours in Asia can be grouped on the basis of progress made to date in providing an adequate telecoms system. While every

country plans substantial telephone line growth, the markets of the Asia–Pacific region fall into three broad groups (Cane, 1995):

1. The first consists of the developed nations, principally Australia/New Zealand, Hong Kong, Singapore, and Japan. These countries do not need external investment to create new infrastructure. They are chiefly concerned with privatizing state-owned monopolies and introducing new competition to improve efficiency and reduce prices.
2. The second division includes countries such as Korea, Taiwan, Malaysia and Thailand, that have already instituted reforms and whose telecoms privatization is to some extent matched by their economic activity. What they need is not finance from abroad so much as expertise to help develop their networks and then use them properly.
3. Third are the developing economies of Pakistan, China, India, Indonesia, and the Philippines where the telecoms infrastructure is not sufficiently developed to sustain the growth of industrial activity.

For this last group of countries, progress will need to be made in a wide spectrum of areas including expanded services, broadened infrastructure, improved legal framework, and better-trained human resources. Clearly political strife and a shortage of hard currency have placed Pakistan in this latter group of countries.

6. Approaches toward network growth

Despite the similarities in infrastructure development, political uncertainties, and economic pressures, South Asian countries have charted varying approaches to network growth (CI, 1992). India, the largest player in the region, consistent with its overall policy of self-reliance and the development of local industry, has chosen a more conservative, inward-looking approach. Its smaller neighbours, Sri Lanka, Pakistan, Bangladesh, and Nepal, have been innovative in balancing the need to develop their networks with a socialist political ideology.

Pakistan, Sri Lanka, and Bangladesh have used a liberalized approach to sectoral reform and telecoms development. The Pakistan–Bangladesh–Sri Lanka approach is two-pronged. The state telecommunications corporation in each country has decided to franchise specialized services such as cellular, paging, and datacoms. At the same time, sectoral policy reforms are being put in place with the ultimate objective of improved access to private capital markets.

7. Markets and services

Again, using the Asian–Pacific countries as a basis of comparison, it is useful to view competition for telecommunications services and equipment along a continuum beginning where the market is essentially closed to where it is fully open. In

this regard, the country entered the 1990s with its markets classified as relatively closed by the World Bank (Table 2).

As might be expected, PTC dominates most markets, providing the following services (Hunter, 1994):

1. Local telephone
2. Long-distance telephone
3. International telephone
4. National and international telex
5. Point-to-point leased circuits
6. Packet-switching data networks
7. Testing of telecom equipment

Table 2
Market liberalization in selected Asian countries, 1992

Country	Terminal equipment	Value added services	Cellular radio/paging services	Long distance services	Local exchange services
Pakistan	Rel. Open	Pt. Open	Pt. Open	Rel. Closed	Rel. Closed
India	Rel. Open	Rel. Open	Pt. Open	Rel. Closed	Rel. Closed
Bangladesh	Pt. Open	Rel. Open	Rel. Closed	Rel. Closed	Rel. Closed
China	Pt. Open	Pt. Open	Rel. Closed	Re. Closed	Pt. Closed
Japan	Wd. Open	Wd. Open	Rel. Open	Rel. Open	Rel. Closed
Indonesia	Pt. Open	Rel. Open	Pt. Open	Rel. Closed	Rel. Closed
Malaysia	Wd. Open	Wd. Open	Pt. Open	Rel. Closed	Rel. Closed
Philippines	Rel. Open	Rel. Open	Pt. Open	Pt. Open	Pt. Open
Singapore	Wd. Open	Wd. Open	Pt. Open	Rel. Closed	Rel. Closed
Sri Lanka	Wd. Open	Wd. Open	Rel. Open	Rel. Closed	Rel. Closed
Thailand	Rel. Open	Rel. Open	Pt. Open	Rel. Closed	Rel. Closed
Vietnam	Pt. Open	Pt. Open	Rel. Closed	Rel. Closed	Rel. Closed

Country classification

Relatively closed (Pakistan, Vietnam, Singapore)

- Monopoly of network facilities
- Competition for customer premises equipment (CPE) and some services (e.g., data networks over leased lines or corporate, privately owned networks are permitted)

Partially open (Germany, France, Thailand, India, Malaysia, Sri Lanka, Mexico)

- Monopoly of network facilities
- Competition for CPE and some telecommunications services (e.g., mobile, value added, satellite) except basic switched telephony.

Relatively open (Canada, Australia)

- Competitive networks permitted for mobile and long-distance telephony, but not for local loops.
- All services are competitive and resale is permitted (except possibly for international services)

Wide open (UK, New Zealand)

- Competing local and long-distance networks permitted (subject to some licensing hurdles and foreign ownership restrictions)
- All services competitive (with some exceptions for international services)

Source: Peter L. Smith and Gregory Staple, *Telecommunications Sector Reform in Asia: Toward a New Pragmatism* (Washington: The World Bank, World Bank Discussion Papers, no. 232, 1994).

8. Training for own as well as foreign staff
9. Installation of department and extra-departmental public call boxes (PCOs)

7.1. Domestic market

PTC is the exclusive provider of domestic fixedline telephone services in Pakistan. Its domestic telephone operations, which consist of local exchange and domestic long-distance, represent PTC's largest source of revenues. For the fiscal year that ended 30 June, 1992, domestic telephone operations accounted for Rs 12.7 billion, or approximately 62.9% of total revenues. Revenues from domestic operations are generated from tariffs on domestic long-distance and local calls, telephone installation charges and monthly rental charges, of telephone lines.

The level and variety of services offered have improved with the introduction of the digital exchanges. A number of services are only possible with the availability of certain equipment configurations offered in the digital system.

PTC's domestic long-distance network consists of more than 2,500 km of optic fiber cable and an extensive microwave transmission system. This network provides long-distance service to customers throughout the country. Remote areas not covered by this network are provided long-distance service through a satellite-based system (DOMSAT) using circuits leased from INTELSAT, a satellite system owned by international cooperative of approximately 120 nations.

PTC's domestic operations are characterized by a high concentration of telephone lines in major cities. It is estimated that approximately 60% of PTC's customers are residential, and more than 90% are based in urban areas. The metropolitan areas of Karachi, Lahore, Islamabad, and Faisalbad constituted approximately 63% of the lines in service and 80% of the digital lines in service as of June 1992. Rural areas of Pakistan had a line penetration of 0.13 per 100 inhabitants in 1992 although PTC expects to double the number of telephone lines servicing rural areas by 1998. A primary aspect of PTC's operating strategy is to improve its quality of service. As of June 1992, the number of faults per 100 lines per annum was 217. PTC's goal is to reduce the number of faults per 100 lines per annum to 10 by 1998, which would increase call volume.

7.2. International market

PTC is the exclusive provider of international fixed line telephone telex and telegram services in Pakistan, linking PTC's domestic telephone network to approximately 150 destinations worldwide. In 1992 PTC operated three international gateways, two in Karachi and one in Islamabad, and had approximately 2787 international telephone circuits. In addition PTC has four earth stations which provide direct access to 52 countries through the INTELSAT network and a 1177-km analogue submarine cable between Karachi and the United Arab Emirates (UAE) with the capacity of 1,200 channels. Other international outlets to neighboring countries including India, Iran, and Turkey are via coaxial cable and microwave links.

PTC's international operations represent the second largest source of revenues for the company. For the fiscal year ended 30 June, 1992, international operations generated revenues of Rs 6.8 billion, comprising approximately 34% of total revenues.

The growing internationalization of the Pakistani economy has contributed to increasing demand for the international telecommunications services. Between 1988 and 1992 the number on international calls more than doubled, from 42.2 million calls to 89.1 million calls (representing an annual growth rate of (20.5%) while the number of international paid minutes increased from 104.2 million minutes to 235.5 million minutes (representing an annual growth rate of 22.6%).

PTC provides the necessary switching and transmission facilities to connect its domestic telecommunications network to foreign networks, and in coordination with foreign telecommunications companies, to ensure the smooth flow of international traffic between these networks. For example, an outgoing international telephone call from Pakistan originates on one of PTC's local telephone exchanges is transferred to one of PTC's international gateways either directly or through PTC's domestic long-distance network. The call is then switched by PTC's network to the desired international destination via satellite, undersea cable, above-ground cable, or microwave links based on a predetermined routing plan developed by the company in coordination with foreign telecommunication companies.

The foreign carrier receiving the call is then responsible for delivering the call to its final destination. When an international call is received at one of PTC's international gateways, PTC then switched the call from its gateway to the local recipient through PTC's domestic telephone network.

Revenues from international operations consist largely of amounts paid for international telephone calls made from Pakistan and incoming settlement payments from overseas telecommunication carriers for using PTC's domestic network in completing incoming calls to Pakistan. The provision of telephone services between the two countries and the corresponding settlement payments are established through bilateral negotiations between the two carriers.

These agreements, which typically stipulate a per-minute rate in U.S. dollars, govern the rates charged for PTC's use of the facilities of foreign carriers in completing outgoing calls from Pakistan as well as the use of PTC's domestic network in completing incoming calls which are billed in the country of origin. Settlements among carriers are normally made quarterly on a net basis.

As typical in developing countries, the volume of incoming calls to Pakistan has exceeded the volume of outgoing calls, providing PTC with new settlements from foreign telecommunications carriers and a source of hard currency. For the fiscal year ended 30 June, 1992, these new settlements provided PTC with US \$210 million. It is expected that this situation will continue in the foreseeable future. Based on calls to and from Pakistan from the top four international destinations (the United States, the United Kingdom, Saudi Arabia, and the United Arab Emirates) incoming calls to Pakistan accounted for 86.2% of PTC's total international minutes relative to these four countries while outgoing calls from Pakistan accounted for 138%. This imbalance is due in part to the large number of Pakistanis living overseas who take advantage of lower international telephone tariffs in foreign

countries as compared with tariffs in Pakistan. Rates charged for international calls are fixed on a destination-by-destination basis and are not subject to a government excise duty.

7.3. *Related services*

In addition to its domestic and international operations, PTC also operates domestic and international telex and telegraph services. For the fiscal year ended 30 June, 1992, revenues from the company's telex and telegraph services generated Rs. 647 million of 3.1% of total revenues. The volume of telex and telegraph traffic has been declining in recent years, consistent with global trends, as customers switch to facsimile and other data transmission technologies.

PTC also publishes telephone directories annually for each of its nine telecom regions and provides computerized directory assistance for its customers in Karachi, Islamabad, and Lahore. Additional services offered include three packet-switching exchanges for data communications and microwave circuits for Pakistani television.

7.4. *Tariff structure*

Unlike a number of other countries, PTC's business and residential tariff rates are equal. Hence, connection fees, call charges, and line rentals are the same for both business and residential customers. Local calls are also untimed.

PTC's rates for international calls are fixed according to the country of destination. For international outgoing calls, charges are not differentiated by time of day. Further, PTC's international tariffs have increased over time, contrary to the trend elsewhere.

Tariffs on domestic long-distance calls are based on the distance from the origin of the telephone call. In 1992, tariffs ranged from Rs 6/min for a distance of up to 40 km to Rs 48/min for a distance of more than 1,000 km. Discounts of 50–75% are provided for off-peak calling hours. PTC's domestic long-distance rates were increased four times between 1986 and 1991 while rates for local calls were increased five times during the same period. Presently the cost structure of the local call is as follows:

Local call charge (Rs)

Local call fee 1.25

Excise duty 0.75

Total charge per call 2.00

The excise duty charged is payable to the government of Pakistan. This tax is netted out before calculation of PTC revenue.

According to the Telecommunication Ordinance passed in 1994, the tariff structure of the Pakistan Telecommunication Company Limited is calculated according to the following two price cap provisions:

1. In any year, the prices for all basic telephone services will not increase on average more than the percentage rate of increase in the Pakistan Consumer Price Index.

2. In addition, in any year, the residential exchange line rental for basic telephone services will not increase by more than the percentage rate of increase in the Pakistan Consumer Price index, plus ten percentage points.

7.5. Competition

PTC's primary competition comes from those companies that are licensed by the government of Pakistan to provide alternative telecommunication services, including mobile cellular telephones. As part of the privatization of the telecommunication industry, the GOP in 1990 decided to allow the private sector to compete in cellular telephones, radio pagers, and card-operated pay phones. Pursuant to this policy, three private companies were given exclusive licenses to operate cellular telephones in Pakistan and another private company was licensed to operate a radio paging service. Licenses to set up and operate card pay phones were given to 22 companies. In 1992 it was estimated that approximately 12,000 people subscribed to cellular telephone services. PTC does not have a license to operate cellular telephones or radio paging services in Pakistan, though it has the right to apply for such a license.

8. Infrastructure

As of 31 December, 1992, PTC's domestic and international telephone network consisted of 1739 telephone exchanges, including 495 automatic and 1244 manual exchanges. Automatic telephone exchange customers can dial other telephone numbers directly outside their exchange while manual telephone exchange customers must place their call through an operator. Most of the rural areas of Pakistan are served by manual exchanges (Awan and Rahman, 1994).

Automatic exchanges consist of analogue and digital exchanges. Digital switching technology has only been introduced in the past several years. PTC is targeting complete digitization of its long-distance network by 1998 and its entire local network by 2008, which would improve call competition rates, reduce the number of faults and allow the introduction of new value-added services. As a result of rapid modernization and the installation of new lines in the 1990s, the average age of the exchange is relatively low (Awan and Rahman, 1994, p. 10).

9. Legal framework

The Telecommunications Ordinance 1994, was passed by the president of Pakistan on 13 July, 1994, and in effect provides for the dissolution of the Pakistan Telecommunications Corporation, a statutory body, and forms a company, Pakistan Telecommunication Company Limited, to be incorporated under the Companies Ordinance, 1984. The large majority of assets and liabilities of the corporation will be transferred to the company.

The principle objective of the company will be the provision of fixed-line domestic and international telecommunication and related services. The company will hold a license from the Pakistan Telecommunication Authority to provide basic telephone service for a period of 25 years, renewable within 2 years before the expiration of the initial term. The company will have the exclusive right to provide basic telephone services in Pakistan, excluding the northern areas and Azad Jammu and Kashmir for a period of 7 years.

The ordinance also promulgates the establishment of the following:

1. Pakistan Telecommunication Authority. The authority responsible for regulating the provision of telecommunication services in Pakistan and grant of licenses to private and public telecommunication operators. In addition, this authority will also be responsible for setting tariffs.
2. Frequency Allocation Board. To take over the functions performed by the Pakistan Wireless Board, which will from the date of such notification stand dissolved.
3. National Telecommunication Corporation. For the provision of telecommunications services to armed forces, defense projects, Federal government, provincial governments, local authorities, or such other agencies or institutions as the federal government determines.

10. Human resources

By June 1994 PTC had approximately 64,000 employees, an increase of 3% over the year 1992. There has been a steady growth in employee numbers over the last 6 years, reflecting the substantial growth in the network.

The number of lines per employee (a basic measure of manpower productivity) is currently 37 as compared to only 14 lines per employee in 1988. Productivity varies substantially between regions. Some variation is expected because of the quality of the existing network, the rate of network growth and geographical factors. The current workforce is relatively young—some 73% of employees fall into the age range between 19 and 33 years. Given this age profile, and the tendency for PTC employees to have a lifetime employment with the company, staff turnover is likely to continue to be low. PTC also provides training to its staff through a network of 21 technical and vocational training institutes in order to improve their technical, managerial, and customer service skills.

11. Outlook

PTC utilizes 5-year capital expenditure plans to project the development and expansion of its telephone network. The primary focus of the current 5-year plan from 1993 to 1998, is to add enough lines to achieve a penetration of approximately 3.3 lines per 100 inhabitants. It is expected that nearly 50% of these lines will be

completed under a Build, Lease and Transfer Program (BLT) with four major telecommunication suppliers: Alcatel, Ericsson, Siemens, and NEC. The total cost of this 5-year capital expenditure program is estimated to be Rs 110 billion. Other goals of the 5 year plan are to:

1. Increase penetration in the cities of K  rachi, Lahore and Islamabad and install fiber optic rings in the central business districts of these cities.
2. Provide at least one public call office to every village with a population in excess of 500 people.
3. Complete a digital transmission network throughout the country.
4. Launch new value-added and higher margin services.
5. Open additional marketing and customer service centers.
6. Rebuild and digitize portions of the local network.

12. Private telecommunications services

Privatization of PTC is an important component in the government's economic reform strategy. It will mobilize private funds for investment and relieve the government from allocating scarce public funds to activities that can be better performed by the private sector, given a proper regulatory framework. With privatization and the emerging new technologies, the opportunities for private participation in the country's telecoms sector have been dramatically expanded.

While no doubt there are ample opportunities in the more traditional areas of electric and telecoms equipment, much of the new activity will be focused on businesses derived from the newly emerging technologies. The emerging technologies in mobile communications have catapulted wireless, mobile, and personal communications into one of the fastest growing markets in the world. The range of technologies becoming available is immense. Plans are well under way for future wireless and mobile communications systems which will obfuscate the demarcation lines between wireless and fixed telecommunications (Quigley, 1994). Some of the potentially more important areas include the cellular technologies, and radiopaging.

1. First generation cellular technologies—those in use today—are predominantly analogue systems such as AMPS (American Mobile Phone System), TACS (Total Access Communication System) and NMT (Nordic Mobile Telephone) systems.
2. Radiopaging has been dominated by the POCSAG (Post Office Code Standards Advisory Group) system. Second-generation mobile technologies are now becoming commercially available, introducing digital architectures to mobile communications. These include GSM, CT2, DECT, CDMA, and the lesser-known IS-54 and PDC.

The speed of developments in the mobile industry accelerates apace. For example, it took cellular phone manufacturers 8 h to make a cellular phone in 1988; 30 min in 1992. Today it takes a mere 12 min—and this is a telephone containing computer

capacity of between 30 and 40 million instructions per second, equivalent to the power of mainframes of only a few years ago.

GSM (Global System for Mobile Communications) is in the limelight around the world. Developed by the European Telecommunications Standards Institute (ETSI), the technical standards body, GSM is the first harmonized European standard to catch the imagination and the investment of users, operators, and manufacturers alike.

GSM was developed as a pan-European digital cellular radio network architecture; it has evolved over more than 10 years into the standard we see today. Set to grow at an unprecedented rate over the next 5 years, GSM is already far more than merely a European standard. Already it has been adopted as the preferred choice of international mobile network operators in Pakistan and in countries as diverse as Australia, New Zealand, Russia, South Africa, Hong Kong, China, India, and the Gulf States.

Analysts (Quigley, 1994) forecast that there will be 40 million GSM users by the year 2002 in Europe alone. Driven by falling handset prices, competitive tariffs, and wider network coverage, the market should continue its phenomenal rate of expansion. The international roaming capability of GSM, coupled with the phase two supplementary service enhancements such as data communications and fax, is making GSM a serious contender as the benchmark for future global mobile systems.

DCS1800, a digital cellular standard based on the GSM specification for lower power handsets, points to the future in the wireless market. DCS1800 is intended for use as a mass-market personal communications network, or PCN. With a design philosophy quite distinct from its forebears, the key to the PCN market will be simplicity and ease of use.

In radiopaging, developments in memory capacity, functionality, and coverage are vying to reestablish this elder statesman of mobile communications as a flexible and feature-rich medium.

“Wireless Messaging” is the term used by many people in the industry for radiopaging. ERMES (European Radio Messaging), the ETSI standard for digital paging, is taking longer than expected to launch. Third-generation systems are already on the drawing board, with concepts such as “Future Public Land Mobile Telecommunications System” (FPLMTS), “Universal Mobile Telecommunications System” (UMTS) and “Universal Personal Telecommunications” (UPT) already well along in development.

The backbone of these third-generation systems will be Intelligent Networks (Ins) which will enable users to rely on the intelligence in the digital network and handle the mechanics and logistics of routing, storing, and forwarding of data.

Competition in Europe and across the world has driven the market—competition not only in handsets and equipment manufacture—but especially between network operators. At a recent conference on Pan-European Digital Cellular Radio in Athens, GSM was seen as the *de facto* global standard.

Yet, despite GSM’s runaway international success, there is a continuing debate within the industry over the future air interface of digital cellular systems. GSM, DCS1800, DECT, and others use TDMA (Time Division Multiple Access), which

breaks up speech channels into multiple time slots. Over the last few years the industry has been rocked by an alternative digital air interface: CDMA (Code Division Multiple Access), a spread-spectrum technology making better use of available frequencies.

While this brief overview of emerging technologies suggests some of the likely developments in Pakistan, the future will see a blurring of the edges in place-to-place and person-to-person communications. This will, no doubt, give rise to a whole spectrum of follow-on business opportunities for both domestic and foreign private sector firms. With these future developments in mind, the following sections trace the increasing participation of the private sector in Pakistan's telecoms sector.

13. Cellular phones

Telecommunications provision in the developing world varies considerably between and within countries. However, the average level of provision in developing countries is generally lower than that of the industrialized world (Table 3). One of the indications of inadequate provision is the overuse of existing local and trunk plants, leading to poor call-success rates, repeated retries, and greater congestion. Long waiting times for new telephones are typical and, in rural areas, very low numbers of telephones per head of population is the norm (Komiya, 1994).

Until recently, cellular telephones have been marketed as a premium service mainly in industrialized countries. However, with the emergence of the wireless local loop (WLL) system, cellular technology is now being deployed in developing countries, where telecommunications operators are confronted with a poor-quality service. Motorola, Ericsson, Hughes Network Systems, Alcatel SEL, Qualcomm, Northern Telecom, and AT&T are major manufacturers that are committed to WLL systems.

Cellular telephone service in Pakistan began about 5 years ago. Three companies in the private sector have been licensed to establish, operate, and maintain the cellular services. Despite its very high cost compared with the PTC, cellular grew very rapidly, far in excess of the consultants' forecasts in Karachi and Islamabad by providing instant service, rather than the years of waiting for PTC service. This rapid growth of a high cost service demonstrates the strength of the underground economy. The service is limited to the major cities. The Karachi and Islamabad systems use Ericsson AXE ten switches.

Two operators, Paktel (part-owned by Cable and Wireless) and InstaPhone (part-owned by Millicom) have been in operation for several years. A third, PMCL (part-owned by Motorola and Hutchinson), will join them soon. While the existing cellular operators are using AMPS technology, PMCL intends to use GSM technology, which is incompatible with AMPS.

Because of market dynamics, the competition, as well as a general trend of lowering of prices, there has been a dramatic drop in the purchase prices of phones in this short period. The fall in equipment prices has made it possible for the middle class to take advantage of the revolution in personal communications.

The average usage profile is quite high relative to international standards. The usage patterns vary in different regions. This is due primarily to the differing customer profiles in these areas, for example, in rural areas of Punjab, covered by Paktel, people are using cellular phones as unofficial pay phones to call their relatives abroad.

Table 3
Cellular telephone subscribers (July 1993)

Country	System	Launch	Subscribers	Penetration ^a
Pakistan	TACS	1990	20,000	0.18
Algeria	NMT-900	1990	1,700	0.07
Argentina	AMPS	1989	70,000	2.17
Australia	AMPS/GSM	1986	673,200	39.39
Bahrain	TACS	1986	12,000	24.00
Bangladesh	AMPS	1991	500	< 0.01
Brazil	AMPS	1990	67,500	0.45
Canada	AMPS	1985	1,165,500	43.95
Chile	AMPS	1989	67,000	5.09
China	Various	1987	350,000	0.31
Costa Rica	AMPS	1989	2,000	0.67
Egypt	Panasonic	1987	4,300	0.08
Guatemala	AMPS	1991	2,400	0.26
Hong Kong	Various	1984	255,000	43.97
Indonesia	Various	1986	43,000	0.24
Israel	AMPS	1986	45,600	9.79
Japan	Various	1979	1,766,600	14.30
Kuwait	TACS	1986	50,000	23.36
Malaysia	NMT-450/TACS	1985	285,000	15.96
Mauritius	TACS	1992	3,000	2.80
Mexico	AMPS	1989	370,000	4.29
Morocco	NMT-450	1988	5,000	0.20
New Zealand	AMPS	1987	105,000	31.34
Nigeria	TACS	1992	6,000	0.06
Oman	NMT-450	1985	3,500	2.33
Peru	AMPS	1991	19,500	0.87
Philippines	AMPS	1989	73,000	1.19
Saudi Arabia	NMT-450	1981	18,000	1.21
Singapore	AMPS/TACS	1988	135,000	45.00
South Africa	C-450	1986	13,500	0.38
South Korea	AMPS	1984	346,000	8.09
Sri Lanka	ETACS	1989	6,000	0.35
Taiwan	AMPS	1989	450,000	22.50
Thailand	NMT-450/AMPS	1986	352,500	6.16
Tunisia	NMT-450	1985	3,000	0.37
Turkey	NMT-450	1986	73,500	1.31
UA Emirates	TACS	1989	44,000	27.67
USA	AMPS	1983	13,067,318	52.28
Venezuela	AMPS	1988	130,000	6.59
Total			20,203,518	6.79
World (July 1993)			27,294,575	7.54

^a Figures for each country per 1000 of population.

Source: FinTech Mobile Communications (October 21, 1993).

Notes: + Total on July 1, 1993.

The PTC is rapidly expanding and improving its network and a part of the cellular base may disappear over time. It is interesting to see that competition not only causes the market to be shared, but on the positive side helps in customer education and growth of awareness in the market.

The history of cellular telephones in Pakistan provides some interesting insights as to the dynamics of private/public-sector interactions. Initially Paktel and Pakcom were the only two companies given licenses for cellular operations by the GOP. The understanding was that their duopoly would prevail for 15 years. However, in 1991 the government granted a third cellular license, this one to Pakistan Mobile Communications Limited (PMCL). PMCL was a local company but with foreign backing, and it was headed by the family of a federal minister who was also the son-in-law of the president of Pakistan. Paktel and Pakcom protested to the government and also took the issue to the law courts.

In response to criticism in the local press over the seeming nepotism, PMCL has argued that it was actually the first company to make an unsolicited proposal to the then T&T Department, in 1985-1986, to establish and operate a pilot cellular phone project in the federal capital area. At that time private telecommunications operating companies were not being envisaged by the GOP. In 1989 T&T first called for an expression of interest for cellular systems, and there were about 13 respondents. Of these only Paktel and PMCL were short-listed. The Peoples Party government of Ms. Benazir Bhutto removed PMCL from consideration. Licenses were subsequently issued to Paktel and Pakcom. PMCL appealed for redress to the office of the ombudsman, who requested the government to settle the matter amicably. Finally, in August 1991, PMCL obtained the third license. This confusion in the cellular business at its very infancy provides an instructive case of the interface of market forces, political patronage, and legality in a lesser developed country such as Pakistan.

Ultimately, this controversy in the cellular segment might well be determined by market forces. PMCL has conceded a lead of over a year to its two rivals. If it attempts a nationwide network, it will face major barriers to entry from marketing, service and coverage strengths that have been gained by the two existing competitors. If it maintains a regional focus, it might lose market acceptance because of inadequate coverage. A further complicating factor is that PMCL is on a different system from the other two and cannot link up with them. PMCL is on ETAs, or Total Access Communication System, while Paktel and Pakcoms are on AMPS, or Advanced Mobile Phone System.

To avoid such confusion, the government could have provided standardized specifications, as well as consistent investment and licensing criteria. System diversity, which is now emerging in the wider telecommunications network, leads to differences in equipment, protocols, styles, and training. Uncertainty or ineptitude in government policy will make it all the more difficult to combine this disparate network into a cohesive system. Another example of weak policymaking could be the recent decision to grant card phone licenses to 22 different companies. Such concessions might only be motivated by the government's need for short-term political benefits.

13.1. *Paktel*

Paktel is one of three cellular telephone companies operating in Pakistan, and to date, the most successful (Gauhr, 1995). Paktel Limited is a Cable and Wireless company, operating under a license granted by the government of Pakistan to provide cellular mobile telecommunication services in Pakistan (Bamford, 1992). Paktel was formed in January 1990 and went into operation in November 1990 with the introduction of cellular mobile telephone service in Karachi. Since then, Paktel has expanded its service into other areas of the country covering its major urban and rural industrial and commercial centers. With two mobile switching centers (exchanges) and several radio base stations (RBSs) Paktel's coverage area comprises more than 30,000 km² which includes the cities of Karachi, Lahore, Chunian, Gujrat, Sialkot, Faisalabad, Sheikhpura, Wazirabad, Gujranwala, Murree, Rawalpindi, Islamabad, Peshawar, Charsadda, and Nowshera.

The corporate head offices are located at Islamabad and regional operations are managed from offices located in Karachi, Lahore, and Islamabad with branch offices at Faisalabad and Peshawar. Total staff strength to date is more than 250. The average age of employees being 28, explains the energy and dynamism of the Paktel operations.

Paktel has come a long way in a short span of time, and today Paktel holds 65% share of the cellular market. Public awareness of the utility of mobile phones is on the rise. Cellular phones are no longer considered an expensive toy for the rich but an effective business tool and are used by a large cross-section of people from agriculture to government to businesses.

Paktel operations in their own right have appeal: the company was able to declare a profit in the second year of operations. However, in 1992 it ran into major deficits, largely owing to uncollected bills from errant customers. It is said to have been bailed out through a US \$5 million fund injection from the parent company.

Paktel has a strong tradition to being the first. It was the first to start operations, first to launch service in Karachi, Islamabad, Lahore, and Peshawar. The use of value-added services such as conference calling, call transferring, fax and data transmission is on the rise and the way to go for the future. Paktel has plans to expand its network to cover major intercity highways and industrial estates. Product development is underway which exploits the utilization of the basic cellular phone in different applications.

In short, Paktel is a forward-looking, objective-oriented multinational organization that strives for high quality in all spheres of its activities and is keen on maintaining its place as the market leader in the field of mobile cellular telecommunications. Today with more than 35,000 employees worldwide and through the use of advanced innovative technology, Cable and Wireless has pioneered and helped create some of the most sophisticated telecommunication systems in the world. Cable and Wireless and its associate companies now operate as domestic telecommunication providers in 24 countries and also provide international telecommunications for 34 countries.

13.2. Pakcom

Pakcom, which operates under the brand name “Instaphone”, is a joint venture between Millicom International Cellular (MIC), based in Luxembourg, and Arfeen International, a Pakistani firm. Each has a 50% equity share. MIC was incorporated in January 1991, with the merger of Millicom International Holdings Limited of the United States and a sister company, Compile International AB of Sweden. Compile had previously been a subsidiary of Industriforvaltnings Kinnevik of Sweden, which had the major share-holding in the Asian operations, while Millicom handled the Central and South American operations.

MIC now has cellular operations, through subsidiary companies, in several countries. Arfeen International, the local partner, has been involved with cement, chemicals, and telecommunication businesses. Pakcom has two MSCs from Ericsson, located at Karachi and Islamabad. It has eight RBSs, currently servicing Karachi and Islamabad, with plans for expansion to Peshawar and Quetta. Pakcom’s weakness in relation to Paktel is that it was late in entering the sizable central Pakistan market, based around Lahore. Initially, it was confined to southern and northern Pakistan.

13.3. Mobilink

Mobilink, the third cellular mobile phone company, is a joint venture between America’s Motorola corporation and the Saifullah Group and is the first digital company in the Pakistani market. Although beginning operations after Paktel and Instaphone, Mobilink executives feel their company will dominate the market because of its superior technology.

The basic difference between digital and analogue is that the former is eight times more effective than the latter in terms of better voice quality, higher security level and uses eight times less hardware (Donyal, 1994). What the mobile user looks for in a cellular telephone is accessibility. Perhaps Mobilink’s main advantage is that even if the user is in Islamabad, unlike other competitors, that person will be able to receive calls for Karachi without getting an out-of-coverage-area message. Mobilink also sought to expand its market share through pricing their product 50–60% below that of Paktel and Instaphone.

But Mobilink soon got into deep trouble with the intelligence agencies of Pakistan, and their Karachi service was switched off in early July 1994. The trouble is still not resolved and they have suffered a huge setback with more than half of the more than 10,000 phones they sold in Karachi alone being returned.

The Pakistani government requested Mobilink to provide it with a method of monitoring calls on its digital cellular network. The country’s two other cellular operators—Cable & Wireless’ Paktel and Millicom’s Instaphone—complied, but they operate analog systems, making it possible to monitor calls over the air. Mobilink’s network is based on a global system for mobile communications, a digital system that cannot be monitored over the air (MPN, 1995).

The carrier also has developed a plan that would diminish call strength near Pakistan’s borders, thus reducing the possibility of calls going out of that country.

In the extreme, there is a plan that would limit access to Mobilink's system based on the caller's distance from a base station. In this way, no calls could enter Pakistan from India, and calls from Pakistan would be terminated at the border.

The company is awaiting a shipment of equipment it will install at the switch that will allow the government to monitor encrypted cellular phone calls in the city. Apparently, the government has assured Mobilink that its cellular network will be reconnected with the Pakistani national land line system following the equipment's installation.

Mobilink has lost 40–60% of its customers since the government shut down its service. The company has sunk \$32 million into its cellular phone network in Pakistan. The company has committed another \$20 million, but those funds will not be released until this networking problem is solved.

These developments have led one observer to ask "If a company as large and important as Motorola can be mistreated like this, others are going to think twice before investing here" (Gauhr, 1995).

Finally in early July 1995, the cellular market took another blow with the closure of all mobile telephone, pager, and card pay phone services in the commercial capital Karachi as paramilitary troops launched an operation to round up armed fanatics. The action came after 3 days of violence that left at least 41 dead, taking the death toll since the beginning of June to 355. Security officials are convinced that members of Karachi's Mohajir Qaumi Movement (MQM) political party, believed to be behind much of the violence, have been making extensive use of mobile telephones, pagers, and pay phones to evade detection by police. MQM represents Urdu speakers who migrated from India at the time of partition.

The decision means that almost 26,000 mobile telephone subscribers in Karachi—more than half Pakistan's 45,000 mobile phone customers—will not be able to make use of their equipment. No indication was given when services might resume (Bokhari, 1995).

13.4. Problems—future developments

Assuming that Mobilink's current difficulties and the general situation in Karachi can be resolved through the introduction of new equipment, there are a number of reasons why cellular is likely to grow more quickly in Pakistan and neighboring countries than in the more developed countries (FMC, 1994):

1. Fixed networks are inadequate and expansion programs are failing to keep pace with the demand for telephone lines.
2. Cellular has the opportunity to start progressively substituting for the fixed network. Developed countries have fixed networks with costs which are sunk and heavily depreciated, and with pricing policy and forward investment decisions which reflect this. In essence, all companies are competing on the basis of today's replacement costs—not ancient historic costs.
3. Spending power is rising sharply in the region and creating a demand for new high-tech products.

4. Traffic congestion in major urban centers makes it essential for business people to stay in touch with cellular telephones.
5. The mobile telephone and the radiopager are positive status symbols in southeast Asian countries, unlike in Europe, where there is still a stigma attached to using cellular telephones in public places.
6. Roaming is of limited importance so far but will increasingly become an issue with the growth of interregional trade. A number of cellular operators have already adopted the GSM standard and are negotiating roaming agreements.
7. Industrial development will result in a growth in communications-intensive service-related businesses.

14. Paging services

A private-sector company, Digital Communications, is operating a paging service in Karachi and Islamabad. Invitations have been extended to interested companies to establish and operate similar services anywhere in Pakistan. The services include tone, numeric, and an alphanumeric paging, and voice mail services accessed either by operator assistance, which is the most popular, or via computer modem or DTMF telephones. The services are expected to become available countrywide within the next year. Of course, the same problems that plague the cellular phone companies in Karachi also apply to pagers.

14.1. Card pay phones

To date, the government has licensed 19 private companies to install and operate public card pay phones. Each licensee is required to set up a minimum of 250 pay phones in the first year of its franchise. The PTC will provide the requisite number of telephone lines on a priority basis. Two companies have already established card-operated pay phones. The cards are purchased in advance and deducted from as the call progresses.

14.2. Data communications

Data communications is another rapidly changing area and one presenting a number of opportunities for private-sector investment. The most important recent development is the government's announcement to invite proposals from the private sector to establish and operate data networks in Pakistan.

Also significant is the fact that the PTC Network, based on packet-switched network technology has now started offering PDN access through the public telephone (dial up) network. The result will allow medium to small data communication users to access multiple national and international Data bases at reasonable connection cost by dialing a local city number. This facilitates transfer of Data at relatively higher speeds with greater reliability.

In addition, several spin-offs of research in the United States in the field of defense-related technologies are also now available in Pakistan. These include the spread spectrum way of radio transmission that was developed for the U.S. defense establishment as an effective way to overcome jamming. Now radio modems based on this technology are available. These radio modems allow high-speed transfer of data over line-of-sight links. The use of spread spectrum technology due to its very high degree of tolerance for interference and noise maximize the use of radio spectrum, an attribute that prompted the FCC to issue its landmark Part 15 regulation in 1985.

The American experience, which has been copied by many countries of the world, has demonstrated that the reuse and sharing of the same radio frequency in a deregulated mode under spread spectrum technology results in the most effective use of the radio spectrum, and critical natural resource for any country. The deregulation entails that a certain Band of Spectrum is allocated for this technology (spread spectrum) without the need for any frequency allocation of government regulations. Such deregulation is current in the United States and in many countries of Europe and Asia. Pakistan may also follow a similar path.

Large customers who want private data networks seek Sprint as the vendor of choice. National data networks designed, manufactured, and installed by Sprint are operating in more than 30 countries, including Pakistan as well as the United Kingdom, Mexico, Japan, Israel, Norway, and Kenya. These private networks use Sprint's packet switches, concentrators and related data communications equipment, supplied by its new data systems joint venture with Alcatel—Alcatel Data Networks (Cahill, 1994).

Finally cellular phone users are now able to transfer data from remote sites. Now modems are available for PCs as well as note-books which are fully compatible with the cellular network. For these connections, modem models are available which are either stand alone or slip to a note-book and do the job efficiently and neatly. No more external and ungainly interface boxes. These units manufactured by Motorola are now available through their distributor in Pakistan, Saztel Communications and Electronics. Saztel is involved in most of the ongoing data communications projects in one way or the other.

15. Satellites

Pakistan has not developed its own satellite communications system. However, in 1994 the Pakistan Ministry of Communications did invite bids from international companies for the establishment of a satellite communications system on a build-operate-own-transfer (BOOT) basis. The winning company/consortium will be expected to design, procure, develop, launch, operate, manage, and market the satellite system. Financial and technical feasibility studies have to be carried out by the foreign companies concerned themselves. The Pakistan government will make available orbital slots to be used in the project for an initial 15 years. There is also a requirement for a back-up satellite (Cahill, 1994).

The Pakistani authorities say that the company winning the tender will have to be able to demonstrate a strong willingness to work with local companies on the construction and testing of the satellite earth stations. Beyond this, other requirements will include the sharing and transfer of certain technologies and know-how to local entities. As many satellite subsystems as possible are expected to be produced in Pakistan: either under license or through some other form of a collaborative venture. In addition, the authorities are interested in the development of software systems involving local companies.

16. The future

It is difficult to speculate about the future of Pakistan's telecoms sector without examining the issues surrounding the privatization of PTC. Clearly, this is an important component in the government's economic reform strategy. The idea is to mobilize private funds for investment and relieve the government from allocating scarce public funds to activities that can better be performed by the private sector, given a proper regulatory framework. The government has had considerable difficulties to date, casting a shadow over the industry.

The issue—the first Pakistani equity offering of PTC targeted largely at international investors—made a promising start, with demand heavily outstripping the number of shares on offer. Unfortunately, that this soon turned into a debacle, is reflected in the collapse of the PTC voucher. While much of what happened is murky. Several events stand out (Ismail, 1995):

1. The original undervaluation in the first instance.
2. The hasty placement with Union Bank of Switzerland (UBS) and the betrayal of the organized subscribers.
3. The book running by Jardine Fleming in London, which was not free from controversy.
4. The discovery by various investors who had participated in London that the prospectus was inaccurate and PTC had confused the Lines Installed with Access Lines in Service (ALIS) leading to an overestimation of profitability by at least 25%.
5. The subsequent bitterness and threats to sue Jardine Fleming for damages, which was settled out of court by the repurchase of the vouchers by Jardine Fleming.
6. And most recently, the published accounts of PTC for 1993 contain as many as 32 reservations by A. F. Ferguson, the auditors. These accounts have been subject of much comment in the press, which has not been complementary, but is confused and, therefore, may not be accurate.

The faith of the foreign investor has been shaken, and he feels compelled to revise his portfolio and tone down his exposure to the emerging Pakistani market. He has chosen to unload PTC vouchers. The GDRs (global depository receipts) were sold at \$179 each and now trade at around \$92, nearly half the issue price.

Much now depends on how the planned trade sale of a further 26% stake in PTC goes. The government has picked Morgan Grenfell, the investment bank owned by Deutsche Bank of Germany to advise on the selection of a suitable strategic partner for PTC. Several potential suitors are in the frame, including AT&T, Pacific Bell, Siemens, British Telecom, Cable & Wireless and Alcatel. Some say a consortium of telecommunications companies might also be considered.

No doubt the sale of Paktel will be one of the more defining moments for the market this year. If PTC is sold to a good operator, who will add value to the company, that should be good for Paktel and for the market as a whole. However, some say the market is unlikely to stage a sustainable recovery until the government manages to stem the tide of lawlessness in Karachi, and until then foreign investors will remain lukewarm.

The government itself is responsible for much of this problem. Its silence on the affairs of PTC and its unwillingness to shed any light on the financial position of PTC has left a vacuum. Where authentic information is lacking, uncertainty and low rates of investment prevail.

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